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The Many Phases of Matter
by G Venkataraman
Vignettes in Physics, Universities Press : Hyderabad, India (1997)
vii + 98 pages, illustrated; price Rs. 60.00 (soft cover);
ISBN 81-7371-034-1

At the Speed of Light
by G Venkataraman
Vignettes in Physics, Universities Press : Hyderabad, India (1994)
viii + 125 pages, illustrated; price Rs. 40.00 (soft cover);
ISBN 81-7371-009-0

Quantum Revolution I : the Breakthrough
by G Venkataraman
Vignettes in Physics, Universities Press : Hyderabad, India (1994)
ix + 189 pages, illustrated; price Rs. 65.00 (soft cover),
ISBN 81-7371-002-3

This is an impressive collection on diverse topics in Physics by G Venkataraman, targeting mainly the young minds to arouse curiosity and to prepare them for serious study of Physics. In the preface, the author has admitted that he had followed the Feynman's scintillating style of lectures in physics. Certainly it is a laudable effort of the author to delineate the fun and excitement of physics in a very lucid language. Those who are looking for a reasonably balanced book on fundamentals of physics would do well reading this series.

The present reviewer is entrusted with the job of reviewing the said three books in the series by G Venkataraman. The very lucid chatty style of the books has taken the reviewer to the world of The Many Phases of Matter; At the speed of Light and Quantum Revolution I : the Breakthrough—it is quite a nice experience.

In the Many Phases of Matter, the author has nicely initiated the idea of phase and the competition between various phases. In Chapter 2, the author has beautifully described the different phase transitions within solid state and also briefly portrayed the idea of valence fluctuation and also the latest craze about metallic hydrogen in high pressure. He thereafter, nicely delineated the order-disorder transformation symmetry breaking and defects and touched upon the idea of topological defects and defect hierarchy. Fluctuation and critical phenomena are important things to understand and the author has lucidly discussed the matter with a nice hint of the renormalization group theory needed to predict the critical exponents. Superconductivity is a much-discussed topic in recent times and the author has elegantly deliberated it in relation to superfluidity. In an inimitable style, the author has narrated the origin of life as a non-equilibrium phase transition and also the origin of universe. At the end, he has discussed some very important points of understanding and admiring the nature with some examples which are thought-provoking brain teasers not only to the young readers but also to gray-haired physicists.

The second book is "At the Speed of Light"—a book on theory of relativity. It was Albert Einstein who single-handedly developed the theory, first the special theory of relativity and then the general theory of relativity as a natural successor.

In the starting chapters, the author has very elegantly discussed the idea of Galilean transformation, pseudo forces and the historical background, *i.e.*, stationary ether hypothesis and epoch making experiment of Michelson and Morley. Perhaps one could not have discussed the special theory of relativity and relativistic kinematics better than what has been explained here. As a feeling of objects moving at velocity of light, the author has nicely discussed the synchrotron radiation. The brain stimulating paradoxes out of special theory of relativity are discussed here in a very readable way. The author has narrated the whole episode from Michelson–Morley experiment to special theory to the prospect of unified field theory mingled with necessary historical facts.

The next companion volume "The Breakthrough" opens up with famous double slit electron diffraction experiment

in a novel way to unravel the philosophical implications of quantum mechanics and then he takes the reader to the domain of quantum mechanics from the key concepts of classical mechanics. The author has narrated the breathtaking breakthroughs ever had in physics, *i.e.*, emergence of quantum mechanics act by act, scene by scene with all the key players around. It seems to the reviewer that a drama being unfolded by the leading characters. It's true that physics had never encountered such a bust of activities in a very short span of time nor it will happen again. The author's unique way of narrating the whole thing makes the battle of titans as *deja vu*.

The overall presentation of the books is very good though in some places the printer's devil have crept in which will hopefully be rectified in future edition. Young minds with deep curiosity would be much benefited from the author's endeavor. I am sure that the beautifully organized subject with nice illustrations will make the reading very enjoyable. The reviewer congratulates the author for putting up this invaluable series. We expect some more brilliant works from the author.

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Why Toast Lands Jelly-side Down

by Robert Ehrilch

University Press (India) Ltd. : Hyderabad, India (1999)
x + 196 pages, illustrated . price Rs. 140.00 (soft cover),
ISBN 81-7371-160-7

The author of this book is a Professor of Physics at George Mason University and has edited several other books on Physics demonstrations.

The laws of Physics are interesting and attract the students because many of them have impact in day to day life. But sometimes the interpretations are too clumsy or mathematical. Demonstrations make them interesting and approachable to common people also. But it is not easy to devise fruitful demo. The demos should be pedagogically sound *i.e.*, meaningful and not a recreation from the boredom of abstract laws of Physics. The author has explained this with examples in the first chapter.

The book comprises of 12 chapters of which the first chapter emphasizes the designing of the demos, their importance of being quantitative and importance of discussion in order to improve it.

The subsequent 4 chapters deal with simple demonstrations covering dynamical laws of mechanics like Newton's Laws, Accelerometers, Statics, Orbital motion, Angular momentum and the basic laws of Physics dealing with the Conservation of momentum and energy.

Each of next seven chapters considers respectively the following phenomena : Fluid dynamics, Waves, Electricity and magnetism, Optical interference and Modern Physics.

Thus, the book covers almost all the subjects that are taught in High School level. This is a collection of about hundred examples of simple physics demonstrations.

Most of the experiments are designed in such a way that they can be shown by overhead projector (OHP) which has a great visual effect to a large number of students.

The name of the book is interesting and at once catches the eyes of book lovers. Most of the people will try to look into the book and examine the reason as to why a toast generally lands with jelly side down. The picture on the front cover shows that while falling from a table it makes an angular velocity and as a result with an initial angle of say, 30°, it can be calculated that if the table height is upto 0.5 meter the toast will invariably fall with jelly side down. If the table height is above that the probability is almost half. If it is more than near 1 meter the jelly side will be up. This has really been demonstrated varying the height of the table and attaching an aluminum sheet on one surface of the bread instead of butter. It has nothing to do with air friction or anything else which most of the people assume initially.

The author also simply demonstrated the essence of many complicated experiments, say in Modern Physics. For example, the Michelson Morley experiments on the effect of light velocity with ether wind have been simulated using roller balls. Sometimes the simple demonstration has lots of oversimplifications; nevertheless it carries the main theme of that historical experiment.

It is not possible to give an account of different interesting topics covered in this book within a short space. It suffices to say that the demonstrations are simple, cost effective and is appropriate for a large number of students in a class. It is also easy to understand the theme of the experiments since almost with each illustration, there are pictures of the whole assembly.

The high school students are some times afraid of further continuing study with Physics as major as they think that the subject is either too mathematical, abstract or devoid of common sense. This book will simply make them think otherwise for the simple demonstrations will make a permanent impression on their minds.

The publication of this book is timely and is a must for high school students and specially for teachers.

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Groups and Symmetry : A Guide to Discovering Mathematics

by David W Farmer

Universities Press (India) Limited : Hyderabad, India (1998)
102 pages, illustrated, price Rs 85 00 (soft cover),
ISBN 81-7371-107-0

The book under review contains a detailed description of Symmetry and Groups used in Mathematics and Physics. The pictorial representation of various symmetries makes very simple to realize the relation between Mathematics and symmetry found in nature.

The first chapter describes the symmetry properties and the determination of basic unit of three regular grids, square, hexagon and triangle. The symmetry operations by translation, rotation, mirror reflection, glide reflection and also the combined operations are well demonstrated. The symmetry of finite figures by rotation and mirror reflection and the multiplication rule of successive symmetry operation are presented. The translation symmetry has been represented by stripe patterns.

The mathematical formulation of symmetry operations is done in group theory. A group is determined by the four properties : (i) Identity, (ii) Closure, (iii) Inverse, (iv) Associativity, of symmetry operations. The subgroup of a group and isomorphism between two groups are discussed in Chapter 6. The basic idea to find other elements in a group through generators, is generally determined from the Cayley diagram. The Cayley diagram for the symmetry groups of triangle, square, stripe and some wall patterns are well described. The practical uses of group in art and architecture are also discussed at the end chapter of this book. It contains a number of good references in different topics on group theory.

Symmetry and group theory are very important and useful to understand and to solve the complex problems in science and engineering. This is a well-written and interesting book for the beginners in the field of symmetry and group theory. It seems to me that this book is very suitable for undergraduate courses.

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